MANAGERIAL INCENTIVES AND THE EFFICIENCY OF CAPITAL STRUCTURE IN U. S. COMMERCIAL BANKING

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Abstract

We extend the literature on the effects of managerial entrenchment to consider how safety-net subsidies and financial distress costs interact with managerial incentives to influence capital structure in U.S. commercial banking. Using cross-sectional data on publicly traded, highest-level U.S. bank holding companies, we find empirical evidence of Marcus' proposition (1984) that there are *dichotomous strategies for value maximization*—one involving relatively higher financial leverage and the other, lower financial leverage. We find that a less levered capital structure is associated with higher charter value and *vice versa*. Moreover, differences in charter value result in *dichotomous strategies for managerial entrenchment*: under-performing, less levered firms hold too little capital while under-performing, more levered firms hold too much.

Key Words: capital allocation, efficiency, agency problems, corporate control, charter value
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1. Introduction

Commercial banks face unusual incentives for structuring equity capital that arise from the unique nature of their liabilities — demandable debt (deposits) that participates in the economy's payments system.[1] To protect the payments system, entry into commercial banking is restricted, and bank risk-taking is regulated. In addition to limits on entry, government safety net provisions of deposit insurance and access to liquidity at the Federal Reserve discount window reduce the potential for liquidity crises during periods of perceived or actual financial distress. Chartering and safety-net protections generate well-known, contrasting incentives for capital allocation: first, the incentive to increase financial leverage to exploit the cost-of-funds subsidy created by under-priced safety net subsidies (Merton, 1977) and, second, the incentive to reduce financial leverage to diminish the potential for costly financial distress that threatens a bank with the loss of its valuable charter. Marcus (1984) hypothesizes that these contrasting incentives for capital allocation result in *dichotomous strategies for value maximization* (p. 557): ". . . [W]hen a bank charter has value because of barriers to entry into the industry, a value-maximizing bank will choose either extreme high-risk or low-risk strategies. Midrange policies will be suboptimal."

Keeley (1990) uses Tobin's *q* ratio to gauge banks' charter value and finds that a higher charter value is associated with a higher ratio of capital to assets. If we define a bank's charter value as the value of its assets in a competitive auction, then charter value captures the value of the bank's investment opportunities — its market opportunities and advantages. Keeley's evidence suggests that banks with more valuable investment opportunities protect this charter value by using a higher proportion of equity capital to finance their asset portfolio.

While this empirical finding is broadly consistent with Marcus' hypothesis, it does not consider the possibility that some banks might pursue capital strategies that sacrifice value. In the presence of incentive misalignments between managers and other stake-holders, banks may fail to achieve the highest potential value of their assets. In that case, Tobin's *q*, the ratio of the achieved market value of assets to their replacement value, falls short as a gauge of banks' charter value by the difference between the highest potential value of their assets and the value achieved by their managers.[2] Thus, a bank's lost market value reflects the severity of its agency problems.

This study relaxes the assumption that managers maximize the value of bank assets. We examine how the relationship between a bank's charter value and its capital strategy is influenced by incentive misalignments between insiders and outsiders. Allowing for agency problems, we look for evidence of Marcus' hypothesis of dichotomous capital strategies for value maximization that differ according to banks' charter value as well as evidence that some bank managers choose a "suboptimal" capital allocation. We then ask how charter value and ownership structure influence capital strategy and financial performance.

In relaxing the assumption of value maximization, we propose an alternative to Tobin's *q* for

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[1]Flannery (1994) analyzes the role of demandable debt in the optimal capital structure of banks.

[2]Note that in some studies Tobin's *q* is used to measure managerial effectiveness in generating value rather than as a measure of the value of investment opportunities.

proxying charter value. Tobin's *q* measures *achieved* market value, and this differs from *potential* market value if agency problems lead to managerial inefficiency. A plot of the achieved market value of banks' assets against their investment (replacement) cost produces a "shotgun" scatter of points where some banks achieve a higher market value than others for the same investment in assets. An upper envelope fitted to these market values provides a measure of the highest potential value of any given investment in assets. To minimize the influence of luck on market value, the upper envelope can be fitted using stochastic frontier techniques.

The upper envelope described above is a *broadly defined* measure of a bank's potential value that asks, what is the highest potential value of a bank's investment over all markets represented in the sample? The sole reference point for comparisons in this broad measure of potential value is the size of a bank's investment in its assets and not the conditions of the local markets in which it operates. This implicitly includes the decision to invest in a particular market as a component of managerial effectiveness. The difference between this broadly defined measure of potential value and achieved market value — *lost market value* — is our preferred measure of financial performance for examining managerial efficiency. For robustness, our empirical analysis is also done using *achieved market value* as a measure of financial performance.

To measure charter value, we obtain a more narrowly defined measure of the highest potential value of a bank's assets in the markets in which it operates. While the decision to invest in any particular market is a component of managerial effectiveness, a narrowly defined measure of potential value that conditions on existing market location is a more appropriate measure of a bank's value to potential acquirers (i.e., charter value). To obtain this narrower measure of potential value, we fitted the stochastic upper envelope over not just banks' investment in assets but also over measures of their distinctive local market conditions, such as the Herfindahl index of market power and a macroeconomic growth rate. This approach provides a measure of the highest potential value of a bank's investment in assets conditional on its location. In contrast to Tobin's *q* ratio, the stochastic upper envelope minimizes the influence on value of both managerial inefficiency and luck.[3] It provides a measure of charter value that is an *exogenous* component in the investment decisions of individual banks.

Using cross-sectional data on publicly traded, highest-level U.S. bank holding companies, we obtain empirical evidence for the following main points:

- We find strong support for Marcus' (1984) proposition of dichotomous strategies for value maximization — one involving relatively higher financial leverage and the other, lower financial leverage. Allowing for non-value-maximizing bank managers, we also find that some banks choose "suboptimal" capital strategies that sacrifice value. High-leverage banks that under-perform are relatively under-levered, while low-leverage banks that under-perform are relatively over-levered.

[3]Since the frontier represents the "best observed practice," we cannot say it eliminates any effects of inefficiency. Hence, we say it minimizes the effects of inefficiency.

These results are robust to size-related effects.

- The least levered banks in our sample appear to have fully exploited the gains from increasing equity capital. The most levered banks in the sample have unexploited gains where lowering equity would improve financial performance. This result suggests the possibility that regulatory restrictions on capital adequacy prevent high-leverage banks from fully exploiting the potentially mispriced federal safety net.[4]

- We find that higher charter value (i.e., a better investment opportunity set) is more likely to be associated with choosing a less levered capital strategy.[5] While other studies have also found this association, our results add to this finding by indicating that *higher charter value is more likely to be associated with a poorer performing, less levered capital strategy than with a better performing, less levered strategy.*

- We propose a two-part corollary to the Marcus hypothesis to help explain the stronger association between higher charter value and poorer financial performance.

  First, higher charter value — more valuable investment opportunities — improves managers' trade-off (see Jensen-Meckling (1976)) between producing value and consuming agency goods (e.g., perquisites, shirking, building empires, etc.). *Our evidence suggests that managers respond to a higher potential value of their bank with an elastic consumption of agency goods.*

  Second, higher charter value and its associated low-leverage strategy reduce the opportunity cost of increasing debt to improve managerial control. Adding debt can reduce the probability of losing control through a take-over while decreasing debt can reduce the probability of losing control through financial distress.[6] Since banks with higher charter value use a less levered capital strategy to

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[4]While capital regulations might prevent some banks from achieving their highest potential value through increased leverage, this result might reflect an appropriate regulatory policy if the public benefit of bank safety (protection of the payment system) exceeds the private benefits from higher leverage.

[5]These results are consistent with the findings in Keeley (1990), Demsetz, Saidenberg, and Strahan (1996), and Galloway, Lee, and Roden (1997), who study the capital structure of commercial banks . However, these studies do not consider the role of agency problems.

Other studies have considered agency problems in the association between capital structure and the value of investment opportunities. Smith and Watts (1992) investigate non-financial firms and find evidence that lower financial leverage ratios are associated with better investment opportunities and hypothesize that the difference in leverage between firms with better and poorer investment opportunities ameliorates agency problems—under-investment in the case of firms with better investment opportunities and over-investment in the case of firms with poorer opportunities. McConnell and Servaes (1995) find similar results and, following Smith and Watts (1992), hypothesize that low leverage at high-growth firms is a response to the under-investment problem of debt while high leverage at low-growth firms addresses the potential for over-investment (or empire-building without good prospects). They define investment opportunities by the price-earnings ratio.

[6]The value-maximizing level of debt is usually thought to exceed the level preferred by managers, who would rather avoid debt's performance pressures that limit their ability to consume agency goods (Grossman and Hart (1982), Jensen (1986), Stulz (1990), and Hart and Moore (1995)). However, recent literature suggests a more complex set of potential outcomes. In particular, under some circumstances incentive-conflicted managers may prefer increasing leverage as a defensive capital strategy.

produce value, it follows that the degree of performance pressure due to financial leverage is *inherently* less for managers of banks with higher charter value than for those with lower charter value. Thus, the defensive value of over-levering is greater for managers of banks with higher charter value. In contrast, the defensive value of over-levering for managers of banks with lower charter value is likely to be smaller than the value of the lessened performance pressure and the lessened probability of bankruptcy that follows from under-levering. Our empirical evidence suggests that *differences in charter value can lead not only to dichotomous strategies to maximize value but also to dichotomous strategies to enhance managerial control.*[7]

- We find further evidence of agency problems in the association between financial performance and differences in the structure of managerial ownership, compensation, and outside monitoring. Controlling for asset size, we find that a higher level of insider ownership is related to poorer financial performance. On the other hand, higher levels of outside block-holder ownership and stock options granted to insiders are associated with better financial performance.

We divide our empirical investigation into two parts. In the first part, Section 2, we consider the

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Studies, such as Israel (1991), Novaes and Zingales (1995), and Billet (1996), show that increased debt as a proportion of assets transfers a larger portion of the take-over gains from acquiring and target shareholders to target debtholders and, thus, reduces the bidder's gain from a take-over. Novaes and Zingales (1995), Zwiebel (1996), and Garvey and Hanka (1999) construct models in which managers balance the effect of higher leverage on decreasing the probability of a take-over against the increased probability of financial distress. Depending on the balance of these opposing effects, managers may over- or under-lever relative to the value-maximizing level of leverage. Novaes and Zingales (1995) show that managers over-lever relative to the value-maximizing level when take-over pressure is strong. Take-over pressure is likely to be stronger when managers' extraction of private benefits produces a significant difference between a firm's potential value and its achieved value.

A number of studies, such as Garvey and Hanka (1999), Safieddine and Titman (1999), and Berger, Ofek, and Yermack (1997), document how the threat of capital-market discipline influences managers' choice of capital structure. In particular, lower leverage is associated with managers who do not face strong monitoring and whose compensation and job tenure is less sensitive to performance. When these managers experience threats to their security, such as a take-over attempt or the arrival of a large outside blockholder, they increase their firms' leverage ratio.

Stulz (1988) notes that an increased leverage ratio concentrates managers' ownership and increases their ability to resist take-over and that, under some circumstances, managers will choose such a strategy even though it lowers market value. Alternatively, increased debt can reduce the probability of a take-over by committing managers to a more efficient business strategy (Jensen (1986) and Zwiebel (1996)).

[7]The possibility that entrenched managers of high-charter-value banks over-lever their banks to protect their control and consumption of agency goods is highlighted by the large number of banks that have been acquired in the last two decades. This wave of bank acquisitions suggests that bank managers whose consumption of agency goods has resulted in relatively large market-value shortfalls are likely to attract the attention of potential acquirers. Brook, Hendershott, and Lee (1998) provide evidence that the market identifies inefficient banks and targets them for discipline. They examine the abnormal returns of banks during the passage of the Interstate Banking and Branching Efficiency Act of 1994, which liberalized the rules on bank acquisitions across state lines. By increasing the number of potential acquirers of a bank and by reducing the transactions costs of an acquisition, this act increased the probability a bank will become the target of an acquisition and thereby raises the bank's *ex ante* value. As expected, they find that the abnormal return of poorly performing banks reacts more positively and that this reaction is limited by factors correlated with managerial entrenchment. Thus, banks with higher levels of market-value inefficiency face a greater threat of acquisition and can restrict this threat by taking defensive actions. Hadlock, Houston, and Ryngaert (1999) document managers' incentive to take defensive actions. Although overtly hostile mergers are rare in banking, they find high levels of managerial turnover following bank acquisitions and note that even *apparently* non-hostile bank acquisitions pose a considerable threat to the managers of target banks. Hence, inefficient bank managers can be expected to take defensive steps.

association between a bank's capital structure and its financial performance; and, in the second part, Section 3, we investigate how managerial incentives influence capital structure and its performance.

2. The Influence of Capital Structure on the Financial Performance of Banks

In this section, we detail the variables used to characterize a bank's production plan and capital structure. In addition, we outline our measure of lost market value (inefficiency), and we discuss the evidence of dichotomous capital strategies obtained from regressing our two performance measures on the production plan and capital structure.

We use data on 190 highest-level bank holding companies in the United States in 1994. The balance-sheet items were obtained primarily from the Federal Reserve Y-9C Consolidated Financial Statements for Bank Holding Companies. The end-of-year number of shares outstanding were obtained from the Standard & Poor's Compustat database while end-of-year stock prices were retrieved from the data banks of the Center for Research in Securities Prices (CRSP).

2.A. The Production Plan and Capital Structure

Unlike individual investors who *buy* market-produced assets, commercial banks *produce* information-intensive assets and financial services using labor and physical capital, and they lever these assets using demandable debt (deposits) and other borrowed funds.[8] Thus, a bank's production plan consists of on-balance-sheet assets, off-balance-sheet financial services, the level of equity capital, and the amounts of other financial and nonfinancial inputs. We control for the credit quality of the bank's loans and for its growth opportunities and market power.

The production plan is specified as follows. The outputs include on- and off-balance-sheet products. The former consist of liquid assets (the sum of cash, balances due, federal funds sold, reverse repurchase agreements, and securities), commercial and industrial loans, agricultural loans, loans to individuals, real estate loans, other loans, leases, assets held in trading accounts, investments in unconsolidated subsidiaries, intangible assets, customers' liabilities related to bank acceptances, and other assets. The off-balance-sheet products are credit guarantees (unused portions of lines of credit, standby letters of credit, and so on), the notional amount of swaps, and the notional amount of all futures and options activity.

The inputs consist of labor (measured by the number of full-time equivalent employees), physical capital (measured by the amount of premises and fixed assets), uninsured domestic deposits, all other domestic deposits, and other borrowing (foreign deposits, federal funds purchased, repurchase agreements, commercial paper, subordinated notes and debentures, mandatory convertible securities, and trading account liabilities). Equity capital is measured by the book-value of shareholders' equity.

Because of the accounting identity relating equity capital to assets and liabilities, we must either impose parameter constraints or omit some components of the balance sheet. We chose to omit some liability

[8]Bhattacharya and Thakor (1993) review the literature that constitutes the modern theory of financial intermediation. This theory defines commercial banks' comparative advantages in producing information-intensive assets and financial services that follow from their principal liability, demand deposits.

items from our list of regressors. The omitted liabilities are the bank's liabilities on acceptances outstanding, mortgage indebtedness, minority interest in consolidated subsidiaries, and other liabilities. We have also omitted preferred stock.[9]

To control for the credit quality of loans, we use the amount of nonperforming loans (the sum of accruing and nonaccruing loans, leases, and other assets past due 90 days or more) plus gross charge-offs. We add charge-offs to past-due loans to account for differences among banks in their aggressiveness toward charging off past-due loans.

To control for the economic environment, we include a measure of market power and a measure of growth opportunities or potential. Market power is proxied by a Herfindahl index of the bank's share of deposits in the markets in which the bank operates. A bank's growth opportunities are proxied by a 10-year weighted average growth rate of personal income: for each state in which the bank operates, the state's 10-year average growth rate in personal income is weighted by the bank's proportion of deposits located in that state. The data for the full sample are summarized in Table 1.

We estimate the following relationship with ordinary least squares:

level of financial performance = f(amounts of various types of on-balance-sheet assets, amounts of various types of off-balance-sheet financial services, amount of equity capital, amounts of various types of deposits, other debt, labor, physical capital, loan credit quality, growth opportunities, market power). (1)

As noted above, we use two measures of the level of financial performance, both based on the market value of assets, which is proxied by the sum of the market value of equity and the book value of liabilities.[10] The first measures a bank's financial performance by achieved market value—the difference between the market value of its assets and a proxy for their replacement cost, their book value net of goodwill. The book value of bank assets net of goodwill is often used as a proxy for the assets' replacement cost, since actual replacement costs are usually difficult to obtain.[11] The second measures a bank's level of financial performance by lost market value—the difference between the highest potential value of its assets and their achieved market value. This difference is the bank's *market-value inefficiency*.[12] In the next section we

[9]Preferred stock is a hybrid security that some would consider a component of debt and others, a component of equity. In any case, preferred stock is a small item on the balance sheet of the few institutions in our sample that have it.

[10]See, for example, Keeley (1990).

[11]Since goodwill is a component of market value, it should be subtracted from book value to obtain a proxy for replacement cost. See Demsetz, Saidenberg, and Strahan (1996) for a discussion of using this adjusted book value as a proxy for replacement costs.

[12]Our regression equation is subject to heteroskedasticity for two reasons: first, because a size effect is likely to be present and, second, in the case of the market-value inefficiency measure, because the dependent variable is estimated. (As Saxonhouse (1976) shows, an estimated dependent variable can introduce heteroskedasticity into the regression.) Since a rigid functional form for heteroskedasticity is subject to misspecification, we reject this approach and, instead, accept heteroskedasticity of unknown form and use typical OLS estimates and their robust (to heteroskedasticity of unknown form) standard errors, called White's heteroskedasticity robust standard errors. However

describe how we estimate the highest potential value of a bank's investment in its assets and its market-value shortfall.

2.B. Fitting a Stochastic Upper Envelope to Gauge Firms' Market-Value Inefficiency

We define the market-value inefficiency of a bank's investment in its assets by the difference between the assets' broadly defined, potential (or frontier) market value and their observed market value. The frontier market value can be interpreted as the market value of the most valuable bank of comparable size. To obtain this upper envelope of observed market values defined over adjusted book values, we employ stochastic frontier analysis.

This upper envelope of market values is fitted by appending a composite error term to a regression of observed market values, MVA_i, on adjusted book values, BVA_i. The composite error term, ϵ_i, consists of a two-sided term, v_i, that captures statistical noise and a one-sided term, μ_i, that gauges inefficiency. This composite term fits an upper boundary to the data rather than an average relationship. We employ a quadratic specification of the regression equation to allow for the possibility that the relationship between market and book value is nonlinear. The resulting equation is

$$MVA_i = \alpha + \beta(BVA_i) + \gamma(BVA_i)^2 + \epsilon_i \tag{2}$$

where $\epsilon_i = v_i - \mu_i$, $v_i \sim$ iid $N(0,\sigma_v^2)$, μ_i (≥ 0) ~ iid $N(0,\sigma_\mu^2)$, which is estimated using maximum likelihood.[13] The frontier value, $FMVA_i$, is given by the deterministic kernel of the stochastic frontier,

$$FMVA_i = \alpha + \beta(BVA_i) + \gamma(BVA_i)^2, \tag{3}$$

while the stochastic frontier, $SFMVA_i$, consists of the deterministic kernel and the two-sided error term: $SFMVA_i = FMVA_i + v_i$.[14]

Inefficiency, μ_i, is simply the difference between a bank's stochastic frontier market value and the observed market value or, equivalently, the difference between a bank's value of the deterministic kernel and

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severe heteroskedasticity may be, OLS estimates are still consistent while traditional OLS standard errors are biased and inconsistent. The possibly inconsistent OLS standard errors are all replaced by White's heteroskedasticity robust standard errors, which are consistent under homoskedasticity and under heteroskedasticity of any form.

[13]The log-likelihood function of this best-practice frontier is

$$\ln L = \frac{N}{2}\ln\frac{2}{\pi} - N\ln\sigma - \frac{1}{2\sigma^2}\sum_{i=1}^{N}\epsilon_i^2 + \sum_{i=1}^{N}\ln\left[\Phi\left(-\frac{\epsilon_i\lambda}{\sigma}\right)\right]$$

where N is the number of observations and $\Phi(\cdot)$ is the standard normal cumulative distribution function.

[14]Kane and Unal (1990) produce a model of the implied value contributions of on- and off-balance sheet activities of these firms. Our approach is to incorporate implicitly the market's valuation of an institutions off-balance sheet activities (such as hedging activities) into our assessment of managerial efficiency.

its noise-adjusted market value such that

$$\mu_i = SFMVA_i - MVA_i = FMVA_i - (MVA_i - v_i), \tag{4}$$

where $(MVA_i - v_i)$ is the noise-adjusted, observed market value of assets.

Since μ_i itself is not directly estimable, as in other cross-sectional stochastic frontier studies, we estimate the inefficiency redefined as the expectation of μ_i conditional on ϵ_i:

$$E(\mu_i \mid \epsilon_i) = FMVA_i - (MVA_i - E(v_i \mid \epsilon_i)). \tag{5}$$

These estimates are measured in dollars of lost market value. The details of fitting stochastic frontiers and estimating inefficiency are found in Bauer (1990) and Jondrow, Lovell, Materov, and Schmidt (1982).

2.C. The Performance Effects of Capital Structure

The results of regressing financial performance, equation (1), on the variables that characterize the production plan and capital structure are shown in Table 2 for market-value inefficiency and in Table 3 for the market-to-book difference. The first column of coefficients is derived by estimating (1) using the entire sample of 190 bank holding companies. Since the results may differ between larger and smaller banks, we divide the sample in half by asset size. The second and third columns of coefficients report the results for the two halves, whose dividing line occurs at $2 billion. For either measure of performance, the signs of the coefficients in these three columns are generally in agreement, although the significance levels are different for large and small banks.

Another distinction between banks that might imply that the full-sample results are misleading is the level of capitalization. As discussed previously, the influence of capital may differ between banks with higher and lower capital-to-assets ratios. Consequently, we divide the sample into more and less capitalized banks so that the latter group contains one-third of the sample while the former consists of two-thirds. The capital-to-assets ratio that brings about this division is 0.0773. The choice of this structural break in the sample was consistent with results using recursive Kalman filter estimation techniques applied to the sample ordered by the capital-to-assets ratio (for performance measured by the level of market-value inefficiency). The fourth and fifth columns of coefficients report the findings that follow from this splitting of the sample.

We turn first to the evidence based on the market-value inefficiency measure reported in Table 2. We find distinct differences between banks that have higher capital-to-assets ratios and those with lower ratios. The signs of the coefficients on most types of assets are negative and significant for the less capitalized banks while they are positive and significant for the more capitalized banks. In order to interpret these coefficients, two points must be noted. First, an increase in the amount of a particular type of asset, holding constant all other types of assets and equity capital, implies a corresponding increase in the omitted liabilities. (Recall that we omitted certain liabilities rather than impose the balance sheet identity as a

constraint on the estimation.) Hence, an increase in the amount of an asset type is equivalent to an increase in the ratio of debt to equity capital or a decrease in the capital-to-assets ratio. Second, an increase in the book-value investment in a particular type of asset increases the investment in total assets and the potential (frontier) value of these assets. (This is a movement along the frontier.) The effect on market-value inefficiency of an increased investment in a particular type of asset depends, then, on whether the observed market value increases by more or less than the potential (frontier) value.

Since the coefficients on most types of assets are negative for the less capitalized banks, they imply that an increase in the book-value investment in most types of assets results in a relatively larger increase in the market value of assets for less capitalized banks — an increase that is sufficiently large to *reduce* their distance from the market-value frontier. In contrast, for more capitalized banks an increase in the book value investment in most types of assets results in a smaller increase in their market value — sufficiently smaller that it *increases* their distance from the frontier. Hence, if we control for the unadjusted book value of equity capital, an increase in the level of most types of assets or, equivalently, a decrease in the capital-to-assets ratio decreases inefficiency for less capitalized banks while it increases inefficiency for more capitalized banks.

We turn next to the effect on inefficiency of an increase in the level of equity capital. Since we hold the investment in all types of assets and various types of debt constant, the increase in equity capital implies a corresponding decrease in the omitted liabilities. Hence, it is equivalent to an increase in the capital-to-assets ratio. Since the book-value investment in total assets is held constant, the reference point on the frontier that indicates its highest potential value is also constant so that an increase in market-value inefficiency implies a decrease in market value and *vice versa*.

When we examine the effect on inefficiency of an increase in the level of equity capital, measured by its unadjusted book value, once again, after controlling for asset size, we find that the effect differs between the two groups. For the less capitalized group, an increase in capital increases inefficiency while, for the more capitalized group, it decreases inefficiency. Hence, an increase in the book value of equity increases the market value of assets for the more capitalized banks, which reduces its distance from the market-value frontier. In contrast, for the less capitalized banks, an increase in the book value of equity decreases the market value of assets, which increases its distance from the frontier. Since an increase in capital, given asset size, is equivalent to an increase in the capital-to-assets ratio, this difference in coefficients on capital implies that an increase in the capital-to-assets ratio for the less capitalized group increases inefficiency while it decreases inefficiency for the more capitalized banks. Hence, the implications of the differences in sign between the coefficients on assets and those on equity capital are in agreement.

To help in understanding the results in Table 2, as well as results presented later in the paper, Figure 1 provides a graphical interpretation of the results in Table 2. Figure 1A graphs the relationship between a *single* bank's level of equity capital and its market-value inefficiency ratio. (Since assets as well as the three types of liabilities are held constant, an increase in equity capital in this figure is a substitution of equity for the components of debt omitted in the regressions. Hence, it is an increase in the capital ratio.) We assume

the relationship is well behaved and there is a unique minimum.[15] K_A^* represents the bank's value-maximizing level of equity capital. At K_A' the level of equity capital is excessive so that increasing equity would raise the bank's market-value inefficiency, which is indicated by the positive gradient. Similarly, at $\underline{K}_A$ the bank holds too little equity, and the gradient is negative.

In Figure 1B, we consider two banks with the same amount of assets — a high-capital-ratio Bank H operating at $\underline{K}_H$ and a low-capital-ratio Bank L operating at K_L', but we assume that their value-maximizing levels of capital, K_H^* and K_L^*, differ, as Marcus noted, because of different charter values. If, as depicted in Figure 1B, the gradient is negative at $\underline{K}_H$ for Bank H and positive at K_L' for Bank L, then we know that the value-maximizing level of capital is higher than the observed level for Bank H and lower than the observed level for Bank L. Thus, the value-maximizing levels of capital for the two banks are even further apart than the observed levels. This result in Figure 1B, a positive slope coefficient for the low-capital-ratio bank and a negative slope coefficient for the high-capital-ratio bank, is precisely the regression result we obtain for the "average banks" in the high and low-capital-ratio bank samples. While it is unlikely that there is a unique optimum for all banks in each group, this particular difference in signs for the slope coefficients suggests that there are dichotomous value-maximizing capital strategies.

To ensure that these dichotomous results on the efficiency of capital structure are not an artifact of the frontier technique, we substitute the simple difference between the observed market value and the adjusted book value of assets for the difference between the frontier and observed market values and re-estimate (1). This estimation is reported in Table 3. The signs of the regression coefficients in Table 3 should generally be opposite those in Table 2, since the difference between observed and adjusted book value represents *achieved* market value while the difference between frontier and observed values constitutes *lost* market value. We focus only on the last two columns that report the coefficients for the less and more capitalized groups. Although the estimates obtained using the market-value shortfall are more precise due to the stochastic frontier technique, those associated with the non-frontier measure of performance are nevertheless in *overall* agreement. For less capitalized banks, an increase in the book-value investment in most types of assets, holding equity capital constant, is associated with an increase in the difference between the market and book values of assets — that is, an additional dollar investment in assets increases the market value of assets by more than a dollar.[16] On the other hand, for more capitalized banks, an increase in the book-value investment in assets is associated with a reduction in the difference between market and book values — that is, an additional dollar investment in assets increases their market value by less than a dollar. Hence, a reduction in the capital-to-assets ratio (via an increase in the investment in assets) is related to improved performance in the less capitalized group and worsened performance in the more capitalized group. The sign

[15]Without loss of generality, the minimum inefficiency ratio is drawn at zero in Figure 1. If other relevant variables are not at their value-maximizing level, then the value-maximizing level of capital holding those variables constant will not produce an inefficiency ratio of zero.

[16]The difference, $MVA_i - BVA_i$, increases with the book value investment in assets when $d(MVA_i - BVA_i)/dBVA_i = dMVA_i/dBVA_i - 1 > 0$ or, equivalently, $dMVA_i/dBVA_i > 1$.

of the coefficient on equity capital for the less and more capitalized groups confirm this dichotomous effect, although only the sign for the more capitalized group is statistically significant.

Since larger banks typically have lower capital ratios, it is important to investigate whether the difference in capital's effect on inefficiency between the more and less capitalized groups could really reflect a size difference. Banks in the less capitalized group are larger on average, and the differences in the means are statistically significant. Of course, the regressions run on the subsamples of larger and smaller banks show no evidence of this dichotomous effect of capital — a result that is robust to any variation in the split between larger and smaller banks. In fact, a Wald test applied to the difference between the values of the regression coefficient on the book-value of equity between the larger and smaller banks shows that there is no significant difference in the effect of capital for any of the different splits defining the grouping of larger and smaller banks.

We confirmed this result by applying recursive Kalman filter estimation techniques to variables that characterize the production plan. While this technique is typically used to uncover structural change or parameter instability in time series, it can also be used to uncover structural differences or heterogeneity in cross-sectional models by ordering the data with respect to the reference variables that are thought to generate the structural differences.[17] Here, we consider two reference variables — the capital-to-assets ratio and the book value of total assets. When the data are ordered by the capital ratio, the estimate of the coefficient on the book value of equity evolves from positive to significantly negative, which suggests a possible structural difference in the relationship of inefficiency and the book value equity between the more and less capitalized banks. On the other hand, when data are ordered by the book value of total assets, the evolution of the parameter estimate for the book value of equity does not display any directional move.

This evidence suggests that inefficient holding companies with lower capitalization improve their performance by reducing capital-to-assets ratios while those with higher capitalization achieve better financial performance by increasing their capital ratios — a result that applies to smaller banks as well as larger banks. Hence, the less capitalized group appears to improve efficiency by taking on more risk, and the more capitalized group, less risk. This interpretation receives additional support from the statistically significant negative sign on nonperforming loans (plus charge-offs) for the less capitalized banks. When these banks assume more credit risk, they can expect a higher level of nonperformance. Hence, the negative sign suggests that the less capitalized group can also improve efficiency by assuming more credit risk. This result is also obtained when financial performance is measured by the difference between market and book values (see the last two columns of Table 3).

These dichotomous findings extend as well to the signs on the coefficients for the three types of borrowed funds. Since the balance sheet items omitted from the regressors are bank liabilities, the coefficients on the included liabilities in the regression can be interpreted as the effect of changing the mix of bank liabilities. The statistically significant positive sign for the holding companies in the less capitalized

[17]See p. 118 of Johnston and DiNardo (1997).

group implies that increasing the components of uninsured deposits, other domestic deposits, and other borrowed money increases their inefficiency while, for the greater capitalized group, the negative sign indicates that increased borrowing from these sources reduces their inefficiency. These results are also obtained when financial performance is measure by the difference between market and book values, as an inspection of these coefficients in the last two columns of Table 3 shows.[18]

Interestingly, the dichotomous effects also involve the nonfinancial inputs, labor and physical capital. Again, this dichotomy is obtained using either measure of financial performance. We focus on the frontier-based measure reported in Table 2. The signs of the coefficients of labor and physical capital are positive for more capitalized holding companies and negative for less capitalized holding companies, although the effect is statistically significant only for physical capital. Hence, the inefficiency of more capitalized banks is associated with employing too much physical capital while that of less capitalized banks involves too little. This result will be considered in more detail in the discussion of charter value that follows in Section 3.

Finally, the variables controlling for the economic environment do not, in general, have a statistically significant impact on market-value inefficiency. Although the coefficient on the economic growth variable indicates that a higher growth rate reduces inefficiency, it is not significantly different from zero in any of the regressions. The Herfindahl index of market power is statistically significant only for the less-capitalized banks. As expected, an increase in market power reduces the difference between potential and observed market values.

2.D. Implications for Capital Regulation

The evidence that *under-performing* banks pursuing a high capitalization strategy can improve their financial performance by increasing their capital ratio and that *under-performing* banks pursuing a low capitalization strategy can enhance performance by reducing their capital ratio raises the issue of whether there are banks in the two groups that have fully exploited the gains from increasing or decreasing their capital ratios. This question can be interpreted by reference to Figure 1B. While our evidence indicates that the capital ratio of the average bank in the more capitalized group was less than its optimal K_H^*, the capital ratio of some banks in this group may be value-maximizing. Similarly, the capital ratio of some banks in the less capitalized group may be at their value-maximizing levels even though the average bank's capital ratio is greater than its optimal K_L^*. To investigate this question, we divide the groups with high and low capitalization in half at their respective median capital ratios to generate for each group a higher-capital-ratio subgroup and a lower capital-ratio subgroup. In particular, we are interested in whether the higher-capital-ratio half of the high capital group—the most capitalized banks in our sample—and the lower-capital-ratio half of the low capital group—the least capitalized banks in our sample—have exhausted the gains from their

[18]Wald tests for differences in the coefficients on asset types, liability types, and equity show that when the sample is divided by asset size, almost all pairs of coefficients for either dependent variable are not significantly different at the 10 percent level. Notably, the coefficients on equity are not significantly different. In contrast, when the sample is divided by the capital ratio, almost all pairs of coefficients for either dependent variable are significantly different—notably, the coefficients on equity.

capital structure.

To obtain evidence on this question, we estimate the performance equation (1) separately for each of the four subgroups. Performance is measured by the market-value shortfall in these regressions. (The table of these results is available upon request.) We ask if a variation in the capital ratio is associated with a statistically significant improvement in financial performance in these subgroups. For the most capitalized banks, the coefficient on equity and all but two coefficients on assets are statistically insignificant, and the signs of the two significant coefficients on assets (leases and agricultural loans) are negative. On the other hand, the coefficient on equity and all the coefficients on assets are statistically significant in the less capitalized half of this sample and indicate that an increase in the capital ratio is associated with improved performance. While the lack of statistical significance for the most capitalized banks could result from various econometric considerations, it is also consistent with the possibility that the most capitalized banks have exhausted the gains from their capital structure.

In contrast to the most capitalized banks, the least capitalized banks appear to have unexploited gains in their capital structure. In spite of the small size of these two subgroups (of the less capitalized third of the full sample), the regression coefficient on equity is significantly positive in both the more and less capitalized subgroups. Significant coefficients on assets are all negative. For the least capitalized subsample, all the asset coefficients are significantly negative. Thus, a reduction in the capital ratio for the least capitalized banks in the sample is associated with improved financial performance. These unexploited gains are consistent with the possibility that regulatory capital minimums prevent these least capitalized banks from achieving their value-maximizing capital structure.[19] To the extent that the socially optimal capital ratios for these low-charter-value banks exceed the ratios that maximize their value, economic welfare may be enhanced by these unexploited gains.

3. Managerial Incentives, Capital Strategies, and Inefficiency

The evidence of dichotomous capital strategies that results from regressing the two measures of financial performance on the production plan and capital structure raises three fundamental questions. First, what factors determine which of the two capital strategies a bank adopts? Is a bank's charter value — the value of its particular growth opportunities and market power — the key as Marcus (1984) hypothesizes? Second, the failure of banks to achieve their potential market value, which is documented by the stochastic frontier technique, raises the question of whether this inefficiency results from corporate control problems. Third, how do charter value and corporate control issues interact to complicate managerial incentives for structuring capital?

[19]While all of these banks hold more capital than their regulatory minimum, the excess capital above the minimum level is likely to constitute a cushion to protect against unexpected losses that would erode capital and trigger regulatory intervention and sanctions.

3.A. Explaining Capital Strategies and Financial Performance

We consider managerial incentives that arise from the value of the bank's investment opportunities and from its ownership structure. The variables that characterize these incentives are the highest potential value of a bank's investment opportunities (its charter value, defined formally below), the proportion of its shares outstanding held by officers and directors, the proportion of its shares outstanding represented by stock options granted to senior officers, the proportion of its shares outstanding held by outside block-holders (outside investors with ownership greater than 5 percent), and the number of security analysts following it, which gauges the informational asymmetry the bank faces.[20]

We consider two routes by which managerial incentives can influence financial performance. First, we ask if the incentives represented by a bank's ownership structure influence the relationship we found in the previous section between financial performance and the choice of investment strategy. Then we ask how they affect the choice of investment strategy. To consider whether misaligned incentives influence the financial performance of any given investment strategy, we amend the previous section's regression of financial performance on variables characterizing the production plan and capital structure to include the managerial ownership variables, and we estimate this relationship for the division of the sample by capital ratio. The ownership variables are not statistically significant effect in either of the subsamples.[21] Hence, the relationship between financial performance and investment strategy seems to be independent of incentive misalignments. But we would not expect the choice of investment strategy to be independent of incentive problems.

To investigate the influence of these managerial incentives on the choice of capital structure, we again divide the sample — this time into its more and less efficient halves by the *ratio of market-value inefficiency to the replacement value (adjusted book value) of assets* (asset inefficiency ratio). The two divisions of the sample by the capital ratio and by the efficiency ratio yield four groups: the More-Capitalized/Efficient, More-Capitalized/Inefficient, Less-Capitalized/Efficient, and Less-Capitalized/Inefficient Groups. In Table 4 we compare the means of key incentive variables for these four groups. Since univariate comparisons do not control for other relevant factors and, thus, could be misleading, we check the robustness of the univariate comparisons using a log-linear bivariate logistic regression model to estimate the marginal effects of the incentive variables on the probability that a bank belongs to each of these groups. We control for each bank's asset size and its diversification of macroeconomic risk in its local markets. Because of incomplete information for some of the banks, 164 out of the 190 original observations are used in the bivariate logistic regressions.

A bank's macroeconomic diversification is proxied by a measure of its exposure to macroeconomic risk in its markets. Macroeconomic risk is gauged by the standard deviation of the weighted average unemployment rate in the states in which the bank operates in 1994. It is constructed from the variance-

[20]These data were obtained from proxy statements and Compact Disclosure.

[21]These regression results are not presented in tabular form here but are available from the authors.

covariance matrix, $\boldsymbol{V}$, of state unemployment rates over the period 1985-94. Each state's unemployment rate is weighted by share of total deposits located in that state. If the vector of these weights is designated by $\boldsymbol{s}$, macroeconomic risk then is $[\boldsymbol{s}'\boldsymbol{V}\boldsymbol{s}]^{1/2}$, and the inverse of risk, $1/[\boldsymbol{s}'\boldsymbol{V}\boldsymbol{s}]^{1/2}$, is the bank's measure of macroeconomic diversification.[22]

To model the log-linear bivariate logistic regression (Amemiya, 1985, 314-317), define

CapRatio as a binary variable equal to one when the bank belongs to the more capitalized group and zero when it belongs to the less capitalized group (where the more capitalized group has a capital-to-assets ratio greater than or equal to 7.73 percent),

Inef as a binary variable equal to one when the bank belongs to the less efficient half of the sample and zero when it falls into the more efficient half (where the less efficient half has a ratio of market-value inefficiency to adjusted book value greater than the median value of the sample), and

$\boldsymbol{z} \equiv$ *level, interaction, and quadratic terms* of the root variables, $\boldsymbol{z}_1 \equiv$ (charter value, managerial equity ownership, managerial stock options granted, outside block-holder equity ownership, number of analysts following the bank, bank size in total assets, index of macro diversification).

Then, the log-linear bivariate logistic regression model is specified as

$$p(CapRatio = 0 \text{ or} 1, Inef = 0 \text{ or} 1) \equiv \frac{\exp(\alpha_{1i} \cdot CapRatio + \alpha_{2i} \cdot Inef + \alpha_{12i} \cdot CapRatio \cdot Inef)}{1 + \exp(\alpha_{1i}) + \exp(\alpha_{2i}) + \exp(\alpha_{1i} + \alpha_{2i} + \alpha_{12i})}, \quad (6)$$

$$\alpha_{1i} = \boldsymbol{z}'_i \beta_1, \quad (6a)$$

$$\alpha_{2i} = \boldsymbol{z}'_i \beta_2, \quad (6b)$$

$$\alpha_{12i} = \boldsymbol{z}'_i \beta_{12}. \quad (6c)$$

where *i* is the observation index. The parameters β_1, β_2, and β_{12} of the log-linear bivariate logistic regression model are estimated through maximum likelihood estimation.

To consider how managerial incentives resulting from charter value and agency problems influence whether banks pursue a more or less capitalized investment strategy and are relatively efficient or inefficient, we compute from the estimated system above the derivatives

$$\partial p(CapRatio = 0 \text{ or} 1, Inef = 0 \text{ or} 1) / \partial \boldsymbol{z}_1 \quad (6d)$$

that determine the effect on the probability that a bank belongs to each of the four groups, More-Capitalized/Efficient, More-Capitalized/Inefficient, Less-Capitalized/Efficient, and Less-Capitalized /Inefficient. These derivatives are reported in Table 5.

[22]Hughes, Lang, Mester, and Moon (1999) use this measure to study the benefits of bank consolidation. They find that it is an important factor explaining the efficiency of consolidation strategies.

3.B. Charter Value Measured by the Stochastic Frontier Technique

To examine the influence of a bank's charter value on its investment strategy and its efficiency, we use the stochastic frontier technique to measure charter value. A bank's charter value is the value of its charter in a competitive auction. Typically, a bank's charter value is proxied by its *franchise value* — the value produced by its current owners and managers.[23] However, to the extent that the current managers' inefficiency escapes market discipline, a bank's franchise value will be less than its charter value. Hence, we employ the stochastic frontier technique to obtain a measure of charter value that minimizes this distortion.

We have already used the stochastic frontier method to obtain a measure of a bank's highest potential market value, which is determined solely by the size of the bank's investment in its assets. The location of the markets in which those assets are produced is not taken into account. Hence, for the purpose of bounding the potential value of its assets, the bank's peers are defined only by the size of their investment in assets, not their location.

We distinguish between this *broadly defined* potential market value and a *narrowly defined* measure that we use to proxy charter value. The narrow definition conditions the bank's potential value on the economic environment of the markets in which it operates, while the broad definition does not. We characterize this environment by a bank's growth opportunities and by its market power. Thus, the broad definition gauges a bank's potential value from the highest value of peers that are defined only by the bank's investment in assets while peers used in the narrow definition are given not just by the bank's investment in assets but also by the growth opportunities and market power the bank experiences in its markets. Potential value given by the narrow definition is generally less than that of the broad definition, since the narrow definition holds market opportunities constant in defining peers while the broad definition allows market opportunities to vary, which implies that the set of peers used by the broad definition is larger than that used by the narrow definition.

The narrowly defined measure of the highest potential market value of its assets is obtained by fitting a stochastic frontier to banks' market values where each bank's peers are defined by the book-value investment in its assets (BVA_i), the weighted average macroeconomic growth rate in the markets in which it operates ($Growth_i$), and the weighted average Herfindahl index for these markets ($Herf_i$), where the weights are deposit shares. Thus, banks' market values are fitted as an upper envelope using maximum likelihood:

$$\begin{aligned} MVA_i = \alpha + \beta_A (BVA_i) + \gamma_{AA} (BVA_i)^2 + \gamma_{AG} (BVA_i)(Growth_i) + \gamma_{AG} (BVA_i)(Herf_i) \\ + \beta_G (Growth_i) + \gamma_{GG} (Growth_i)^2 + \gamma_{GH} (Growth_i)(Herf_i) \\ + \beta_H (Herf_i) + \gamma_{HH} (Herf_i)^2 + \epsilon_i \end{aligned} \tag{7}$$

where $\epsilon_i = \nu_i - \mu_i$, $\nu_i \sim$ iid $N(0,\sigma_\nu^2)$, $\mu_i (\geq 0) \sim$ iid $N(0,\sigma_\mu^2)$. The frontier value, $NPVA_i$, measures a bank's

[23]See, for example, Keeley (1990) and Demsetz, Saidenberg, and Strahan (1996).

narrowly defined potential value and is given by the deterministic kernel of the stochastic frontier:

$$NPVA_i = \alpha + \beta_A (BVA_i) + \gamma_{AA} (BVA_i)^2 + \gamma_{AG} (BVA_i)(Growth_i) + \gamma_{AG} (BVA_i)(Herf_i) + \beta_G (Growth_i) + \gamma_{GG} (Growth_i)^2 + \gamma_{GH} (Growth_i)(Herf_i) + \beta_H (Herf_i) + \gamma_{HH} (Herf_i)^2, \quad (8)$$

while the stochastic frontier, $SNPVA_i$, consists of the deterministic kernel and the two-sided error term: $SNPVA_i = NPVA_i + v_i$. Each bank's charter value is proxied by the value of the deterministic kernel.

As the long-standing merger wave of banks testifies, market positioning is an important component of a bank's efficiency, so we measure a bank's market-value shortfall from the broadly defined measure of potential value. Thus, the difference between a bank's broadly defined potential value and its observed market value — its franchise value — gauges its current managers' failure to position their bank well in *all potential markets*. On the other hand, the narrow definition captures a bank's highest potential value *in the markets in which it currently operates*. It is derived from the highest (noise-adjusted) market value of its peers with identical market opportunities. This value capitalizes an acquisition strategy (either as acquirer or as target) so that it does not presume that growth opportunities are restricted to the current markets in which the bank operates. Thus, the narrow definition asks, what is a bank's highest potential market value given its *current* market positioning and the best acquisition strategy? The latter component captures potential synergies involved in an acquisition. Hence, the narrow definition of a bank's potential market value seems to capture the essential components of its charter value, and we use it to proxy a bank's charter value in our empirical analysis.

3.C. Empirical Evidence on the Relationship of Charter Value and Other Managerial Incentives to Capital Structure and Financial Performance

The univariate comparisons in Table 4 offer some evidence that higher charter value is associated with a more capitalized investment strategy. In Table 4, a bank's *relative* charter value is given by the ratio of the highest potential value of assets to their book value adjusted to remove goodwill, which we define as the *investment opportunity ratio*. The investment opportunity ratio is greater for efficient banks in the more capitalized group than for efficient banks in the less capitalized group, but there is no significant difference in relative charter values between *inefficient* banks in the more and less capitalized groups. Since efficient banks in both the more and less capitalized groups are larger than inefficient banks and since larger banks tend to have lower relative charter values, size may be driving this weak relationship between charter value and capital strategy.

To investigate this issue more fully, we estimated a multivariate log-linear bivariate logistic regression (results reported in Table 5). This model estimates the marginal effect of the regressors on the probability of an institution being in one of four mutually exclusive categories — *More Capitalized/Efficient, More Capitalized/Inefficient, Less Capitalized/Efficient, Less Capitalized/Inefficient.* When we control for the effects of size in our bivariate logistic regression, we find that a higher charter value is associated with

a higher probability that a bank is more capitalized and efficient *and* a higher probability that it is more capitalized and inefficient, but the effect is stronger for the inefficient partition than for the efficient. Thus, higher charter value is associated not only with a more capitalized investment strategy but also with a greater relative consumption of agency goods, especially at higher levels of insider ownership. A partition of the sample by levels of insider ownership shows no evidence of this association in the group with the lowest levels of insider ownership — less than 5 percent. In fact, the link between charter value and inefficiency is stronger at higher levels of insider ownership — between 5 and 25 percent — and strongest when insider ownership exceeds 25 percent.

The relationship between charter value and the consumption of agency goods is also clear in the univariate comparisons. Turning again to Table 4, we find that, among banks pursuing the same capital strategy, the investment opportunity ratio of inefficient banks is strikingly higher than the ratio of efficient banks. Nevertheless, the achieved market-to-book ratios are not significantly different between inefficient and efficient banks in the same capital group. It appears that managers of under-performing banks in both capital groups enjoy more valuable investment opportunities but achieve no more value than managers of better-performing banks with less valuable investment opportunities. While the greater consumption of agency goods by managers of under-performing banks is not apparent in the market-to-book ratios, the additional evidence provided by the investment opportunity ratio and asset inefficiency ratio clearly reveal it.

What is the link between higher charter value and an *inefficient*, more capitalized investment strategy? Recall that we define a bank's charter value as the highest potential value of its assets — their value in a competitive auction. Given a bank's investment in its assets, a higher charter value represents a higher *potential* value of this investment — a better opportunity set for consuming agency goods and for enhancing control. From the perspective of Jensen and Meckling (1976), a higher charter value improves the managers' trade-off between market value and private benefits, which is analogous to an "income effect" that increases the demand for private benefits if it is assumed they are normal goods. If agency goods are "normal goods" and "income elastic," an increase in the potential value of a bank's investments leads to a more than proportionate increase in the consumption of agency goods, which implies that the achieved market value of the bank's investments increases less than proportionately. Hence, the shortfall of the bank's achieved value from its potential value (i.e., its market-value inefficiency) increases more than proportionately. Conversely, an increase in the potential value of the investments of managers with an inelastic demand for agency goods increases their bank's market-value inefficiency less than proportionately. Since our evidence indicates that an increase in charter value is associated with a larger increase in the probability that a bank is inefficient and less levered than it is efficient and less levered, it would appear that there are more managers with elastic than inelastic demands — especially at banks where managers own a larger proportion of their bank.

The regressions of financial performance on the production plan and capital structure (equation (1)) provide an interesting clue in the investigation of the sources of inefficiency. For both the regressions of market-value inefficiency (Table 2) and the market-to-book difference (Table 3), the coefficient on physical

capital is statistically significant and positive for the high-capital-ratio (high-charter-value) group and negative for the low-capital-ratio (low-charter-value) group.[24] Thus, inefficient banks with high charter value *over-employ* physical capital while those with low charter value *under-employ* physical capital (relative to the value-maximizing levels). If the consumption of agency goods involves the consumption of physical capital, say in empire building, then this dichotomy of physical capital strategies may imply that managers of banks with higher charter value can "afford" to consume more physical capital.

A higher charter value not only improves managers' opportunity set for consuming agency goods, it also reduces the probability of financial distress and, thus, improves managers' ability to engage in a more levered defensive capital strategy to protect their job tenure and private benefits. The capital structure regressions link market-value inefficiency in the more capitalized group to *under-capitalization*. Inefficient banks in the more capitalized group reduce their inefficiency by *increasing* their capital ratios. Thus, it would appear that higher charter value is not only associated with a more capitalized investment strategy but also with an increased probability that bank managers consume more agency goods and under-capitalize their banks relative to the level that would achieve their banks' highest potential value, perhaps to enhance their control.

In contrast to the effects of higher charter value, Table 5 reports that a lower charter value increases the probability both that a bank is less capitalized/efficient *and* less capitalized/inefficient; however, its effect is stronger on the probability that it is less capitalized and *inefficient*. The capital structure regressions link inefficiency in the less capitalized group to *over-capitalization*. A lower charter value reduces managers' ability to consume agency goods and, by requiring a higher proportion of debt in the capital structure to maximize value, puts greater performance pressure on managers. Hence, incentive-conflicted managers of banks with low charter value may value the reduced performance pressure that follows from over-capitalization more than the heightened pressure that results from a more levered, defensive capital strategy. In short, a lower charter value gives managers a greater incentive to pursue a less capitalized investment strategy to advance shareholders' wealth, but it would also seem to give them a greater incentive to avoid performance pressure by over-capitalizing their banks relative to the value-maximizing level.

To confirm that differences in charter value account for the dichotomous capital strategies, we return to the analysis of section 2.A and regress the market-value shortfall (inefficiency) on the production plan (equation (1)) for the sample split by the ratio of charter value to the book-value investment in assets less goodwill. We vary the split between the low and high ratio groups from the smallest size of 30 for the lowest to 30 for the highest. The minimized value of the sum of squared errors occurs at a split of 34 and 152. (These results are available upon request.) *The dichotomy in capital strategy holds for the sample split by the charter value ratio as well as by the capital ratio*, although the results are not as clean. Nevertheless, a

[24] As we report later, we estimate equation (1) for the sample split by the ratio of charter value to the book-value investment in assets and obtain the same pattern of contrasting signs of coefficients for high and low charter-value groups as we found for high and low-capital-ratio groups.

Wald test of the difference in parameter estimates between the low and high charter-value groups shows a significant difference between most parameters, even when one or both parameter estimates are not statistically significant.[25]

In summary, our evidence of the effect of charter value on capital strategies and efficiency not only confirms Marcus' hypothesis of dichotomous strategies for value maximization, it also suggests that there are dichotomous strategies for managerial entrenchment that also vary between banks with high and low charter values. We seek additional evidence that managerial entrenchment influences capital strategy and financial performance by investigating the relationship between ownership structure and performance.

Additional evidence that misaligned incentives contribute to poorer than average financial performance arises from a comparison of insider ownership at under-performing and better-performing banks: we find insider ownership is twice as large at under-performing banks pursuing a less levered capital strategy and three times as large at under-performing banks pursuing a more levered strategy. The alignment-of-interest hypothesis (Jensen and Meckling, 1976) predicts that an increase in managerial ownership better aligns the interests of inside owners with those of outside owners; however, the entrenchment hypothesis (Fama and Jensen, 1983) contends that an increase in managerial ownership improves managers' ability to resist market discipline and to consume agency goods. Stulz (1988) notes that when managers own a relatively small proportion of the firm, they can improve the bargaining power of outside owners in a take-over attempt and, thus, increase the value of the firm *ex ante*. However, when managers own a large stake in the firm, they can make a take-over more difficult and, consequently, lower the value of the firm *ex ante*. Many empirical studies, such as Morck, Shleifer, and Vishny (1988), McConnell and Servaes (1990), Barclay, Holderness, and Pontiff (1993) and Holderness, Kroszner, and Sheehan (1999) have documented a non-monotonic relationship of firm performance, measured by Tobin's *q*, and insider ownership. Typically, an increase in ownership at low levels of ownership (below 5 percent) increases Tobin's *q* while an increase at moderate levels (between 5 and 25 percent) decreases *q*. There is weak evidence that an increase at higher levels (above 25 percent) may increase *q* slightly. These studies usually interpret the non-monotonic relationship between performance and insider ownership as evidence that the alignment-of-interest effect dominates the entrenchment effect at low levels of ownership while the entrenchment effect dominates at higher levels. The higher levels of insider ownership at under-performing banks in our univariate comparison suggests that these managers may be entrenched: the effect on performance of enhanced control obtained from owning more of the firm seems to dominate the effect of a better alignment of the interests of inside and outside owners. The suggestion of entrenchment is echoed by the effect of charter value evaluated for the three ownership sub-samples.

[25]McConnell and Servaes (1995) find that Tobin's *q* and financial leverage are negatively correlated for non-financial firms with good investment opportunities and positively correlated for firms with poor opportunities. Following Smith and Watts (1992), they hypothesize that low leverage at high-growth firms is a response to the under-investment problem of debt while high leverage at low-growth firms addresses the potential for over-investment (or empire-building without good prospects). They define investment opportunities by the price-earnings ratio.

The striking differences in the proportion of insider ownership between under- and better-performing banks raises the suspicion that asset size may be the key factor, since insiders generally own a smaller proportion of larger banks and larger banks are on average more efficient. Controlling for size (charter value and other relevant factors) in the bivariate logistic regression analysis, we find that the relationship of insider ownership to poorer financial performance is robust: a higher proportion of insider ownership is associated with a higher probability that a bank is inefficient and less capitalized. This result is not surprising since the highest proportion of insider ownership, 23.29 percent, belongs to the less capitalized, inefficient group, followed by the more capitalized, inefficient group at 16.03 percent. In contrast, insiders in the more capitalized, efficient group own an average of 7.79 percent of their banks while insiders in the less capitalized, efficient group own 8.17 percent.

The empirical link between insider ownership and poorer financial performance suggests that the managers of under-performing banks are entrenched and using their stronger control to consume relatively more agency goods than managers with weaker control. Managerial entrenchment can be mitigated, though, when outsiders monitor managers. Outside block-holders hold a sufficiently large stake to motivate them to monitor. Hence, we look for evidence that the better-performing banks in our sample have larger ownership stakes by outside block-holders. In Table 4, the mean proportion of outstanding shares owned by outside block-holders in the more capitalized group is 2.89 percent for the efficient banks and 1.07 percent for the inefficient while, for the less capitalized group, the mean is 6.90 percent for the efficient and 3.66 percent for the inefficient. Although a larger proportion of the efficient banks is owned by outside block-holders, only the difference between the efficient, less capitalized group and the more capitalized, inefficient group is significant. When we control for other relevant factors in the bivariate logistic regression (Table 5), we find that a higher ownership stake of outside block-holders is associated with a higher probability that a bank is *efficient* and less capitalized (the group with the highest block-holder ownership). To the extent that the increased stake of block-holders constitutes an increased threat of market discipline, it would appear that it motivates managers to take on the appropriate amount of leverage and performance pressure to achieve their banks' potential market value.[26] Notably, this association between block-holder ownership and efficiency is statistically significant only in the group where managers own between 5 and 25 percent of their bank. While the incentive to consume potential value as agency goods seems stronger in the greater-than-25-percent group, outside block-holders may be able to exert greater control when managers own less of their banks.

Further evidence of misaligned incentives is obtained by investigating how stock options granted to insiders influences financial performance. Options increase the convexity of the pay-performance relationship. Empirical investigations have usually found a positive relationship between options held by insiders and their firm's financial performance (for example, Guay, 1999, and Hall and Liebman, 1998). In Table 4, the managers of the inefficient banks in each capital group hold more options as a proportion of

[26]There is empirical evidence that outside block-holders can be aligned with an entrenched management. See, for example, Barclay, Holderness, and Pontiff (1993).

outstanding shares than the managers of the efficient banks in the same capital group, although only the relationship in the more capitalized group is significant. In Table 5, the bivariate logistic regression results on stock options show that this univariate relationship is misleading. When we control for the other relevant factors, our estimates indicate that granting insiders a greater amount of stock options as a proportion of outstanding shares is associated with a higher probability that insiders pursue an *efficient*, more capitalized investment strategy. Again, the division of the sample by the level of insider ownership shows that this effect is isolated in the group where insiders own between 5 and 25 percent. Apparently, higher levels of options granted to insiders in this group reduces their incentive to waste firm value while, at higher and lower levels of insider ownership, options have no significant association with capital strategy and performance.

While we included total assets as a control variable, its influence on performance deserves note. In the univariate comparisons in Table 4, we see that efficient banks are larger than inefficient banks while the largest efficient banks pursue a less capitalized investment strategy. When we control for the other relevant factors in the bivariate logistic regression, we find in Table 5 the expected result that a larger amount of total assets is associated with a higher probability that a bank is less capitalized. Interestingly, though, a larger asset size increases the probability a bank is *inefficient* more than the probability it is efficient. Again, this association between inefficiency and asset size is not found where managers own less than 5 percent of their bank; instead, it is found at higher levels of ownership. And at levels greater than 25 percent, a larger size is related *only* to a higher probability that a bank is *inefficient* and less capitalized. Perhaps the association of increased size to inefficiency at banks with relatively high levels of managerial ownership reflects agency problems related to "empire building."

The group of banks whose managers own less than 5 percent of their bank shows little evidence of the agency problems that characterize banks with more insider ownership. Nevertheless, the bivariate logistic regression in Table 5 provides evidence that these banks' performance is positively associated with the number of securities analysts who report on them: a larger number of analysts is associated with a higher probability that a bank is *efficient* and less capitalized. The univariate comparisons in Table 4 also indicate that more securities analysts follow banks pursuing efficient capital strategies than inefficient strategies.

4. Conclusion

We propose a new technique for measuring the efficiency of banks' capital allocation using the difference between the potential market value of their assets computed from a stochastic frontier (upper envelope) and the observed market value of their assets. Measuring financial performance by this technique as well as by the market-to-book difference, we find robust evidence of a dichotomous role of equity capital in promoting market-value efficiency. In particular, under-performing banks that are less capitalized improve their financial performance by reducing their capital ratio and their asset quality while under-performing banks that are more capitalized improve performance by increasing their capital ratio. While the most capitalized banks seem to have exhausted these gains in capital structure, the least capitalized banks have not

— a result that is consistent with the possibility that regulatory minimum capital standards prevent the least capitalized banks from achieving their value-maximizing capital structure (and, perhaps, threatening the safety of the payments system).

We then consider the underlying factors determining a bank's capital strategy and its under-performance. Our results suggest that less capitalized banks may be exploiting the subsidy of under-priced components of the federal safety net while more capitalized banks may be protecting their higher charter value. Moreover, the failure of firms to achieve their highest potential market value, which is documented by the stochastic frontier technique, raises the question of whether corporate control problems allow such under-performance to arise. In finding that banks' market-value shortfall is related to managerial compensation and outside monitoring as well as to banks' potential value from which managers can consume agency goods, we provide evidence that their market-value shortfall results from fundamental agency problems.

Nevertheless, these agency problems are not straightforward. They are complicated by incentives that result from the unusual distress costs of commercial banking and the under-priced federal safety net. Our evidence indicates that, even controlling for the effect of asset size, the influence of equity capital differs markedly between under-performing banks with higher capital-to-assets ratios and those with lower ratios. This dichotomy in equity capital's effect on performance suggests that more and less capitalized banks have different incentives to employ capital—incentives that are importantly related to banks' charter value but also to agency problems.

References

Amemiya, Takeshi, 1985, *Advanced Econometrics*, Cambridge: Harvard University Press, 314-317.

Barclay, Michael J., Clifford G. Holderness, and Jeffrey Pontiff, 1993, "Private Benefits from Block Ownership and Discounts on Closed-End Funds," *Journal of Financial Economics* 33, 263-291.

Bauer, Paul W., 1990, "Recent Developments in the Econometric Estimation of Frontiers," *Journal of Econometrics* 46, 39-56.

Berger, Philip G., Eli Ofek, and David L. Yermack, 1997, "Managerial Entrenchment and Capital Structure Decisions," *Journal of Finance* 52, 1411-1438.

Bhattacharya, Sudipto, and Anjan Thakor, 1993, "Contemporary Banking Theory," *Journal of Financial Intermediation* 3, 2-50.

Billet, Matthew, 1996, "Targeting Capital Structure: The Relationship between Risky Debt and the Firm's Likelihood of Being Acquired," *Journal of Business* 69, 173-192.

Brook, Yaron, Robert Hendershott, and Darrell Lee, 1998, "The Gains from Takeover Deregulation: Evidence from the End of Interstate Banking Restrictions," *Journal of Finance* 53, 2185-2204.

Demsetz, Rebecca S., Marc R. Saidenberg, and Philip E. Strahan, 1996, "Banks with Something to Lose: The Disciplinary Role of Franchise Value," Federal Reserve Bank of New York *Economic Policy Review* 2, 1-14.

Fama, E.F., and M.C. Jensen, 1983, "Separation of Ownership and Control," *Journal of Law and Economics* 26, 301-325.

Flannery, Mark J., 1994, "Debt Maturity and the Deadweight Cost of Leverage: Optimally Financing Banking Firms," *American Economic Review* 84, 320-331.

Galloway, T.M., W.B. Lee, and D.M. Roden, 1997, "Banks' Changing Incentives and Opportunities for Risk Taking," *Journal of Banking and Finance* 21, 509-527.

Garvey, Gerald T., and Gordon Hanka, 1999, "Capital Structure and Corporate Control: The Effect of Antitakeover Statutes on Firm Leverage," *Journal of Finance* 54, 519-546.

Grossman, Sanford J., and Oliver Hart, 1982, "Corporate Financial Structure and Managerial Incentives," in J. McCall, ed., *The Economics of Information and Uncertainty*, Chicago: University of Chicago Press, 107-140.

Guay, Wayne R., 1999, "The Sensitivity of CEO Wealth to Equity Risk: An Analysis of the Magnitude and Determinants," *Journal of Financial Economics* 53, 43-71.

Hadlock, Charles, Joel Houston, and Michael Ryngaert, 1999, "The Role of Managerial Incentives in Bank Acquisitions," *Journal of Banking and Finance* 23, 221-249.

Hall, Brian J., and Jeffrey B. Liebman, 1998, "Are CEOs Really Paid Like Bureaucrats?" *Quarterly Journal*

of Economics 113, 653-691.

Harris, Milton, and Arthur Raviv, 1990, "Capital Structure and the Informational Role of Debt," *Journal of Finance* 45, 321-349.

Hart, Oliver, and John Moore, 1995, "Debt and Seniority: An Analysis of the Role of Hard Claims in Constraining Management,"*American Economic Review* 85, 567-585.

Holderness, C.G., R.S. Kroszner, and D.P. Sheehan, 1999, "Were the Good Old Days That Good? Changes in Managerial Stock Ownership Since the Great Depression," *Journal of Finance* 54, 435-469.

Hughes, Joseph P., William Lang, Loretta J. Mester, and Choon-Geol Moon, 1996, "Efficient Banking under Interstate Branching," *Journal of Money, Credit, and Banking* 28, 1045-1071.

Hughes, Joseph P., William Lang, Loretta J. Mester, and Choon-Geol Moon, 1999, "The Dollars and Sense of Bank Consolidation," *Journal of Banking and Finance*, 23, Nos. 2-4, p. 291-324.

Israel, R., 1991, "Capital Structure and the Market for Corporate Control: The Defensive Role of Debt Financing," *Journal of Finance* 46, 1391-1409.

Jensen, Michael C., 1986, "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers," *American Economic Review* 76, 323-329.

Jensen, Michael C., and William H. Meckling, 1976, "Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure," *Journal of Financial Economics* 5, 305-360.

Johnston, Jack, and John DiNardo, 1997, *Econometric Methods*, 4th ed., McGraw-Hill.

Jondrow, J., C.A. Knox Lovell, I.S. Materov, and Peter Schmidt, 1982, "On the Estimation of Technical Efficiency in the Stochastic Frontier Production Function Model," *Journal of Econometrics* 19, 233-238.

Kane, Edward J., and Haluk Unal, 1990, "Modeling Structural And Temporal Variation In The Market's Valuation Of Banking Firms," *Journal of Finance* 45, 113-136.

Keeley, Michael C., 1990, "Deposit Insurance, Risk, and Market Power in Banking," *American Economic Review* 80, 1183-1200.

Marcus, Alan J., 1984, "Deregulation and Bank Financial Policy," *Journal of Banking and Finance* 8, 557-565.

McConnell, John J., and Henri Servaes, 1990, "Additional Evidence on Equity Ownership and Corporate Value," *Journal of Financial Economics* 27, 595-612.

McConnell, John J., and Henri Servaes, 1995, "Equity Ownership and the Two Faces of Debt," *Journal of Financial Economics* 39, 131-157.

Merton, Robert C., 1977, "An Analytic Derivation of the Cost of Deposit Insurance Loan Guarantees," *Journal of Banking and Finance* 1, 3-11.

Morck, Randall, Andrei Shleifer, and Robert W. Vishny, 1988, "Management Ownership and Market Valuation," *Journal of Financial Economics* 20, 293-315.

Novaes, Walter, and Luigi Zingales, 1995, “Capital Structure Choice When Managers Are in Control: Entrenchment Versus Efficiency,” NBER Working Paper 5384.

Rhoades, Stephen A., 1996, "Bank Mergers and Industrywide Structure, 1980-94," Board of Governors of the Federal Reserve System, Staff Study 169.

Safieddine, Assem, and Sheridan Titman, 1999, “Leverage and Corporate Performance: Evidence from Unsuccessful Takeovers,” *Journal of Finance* 54, 547-580.

Saunders, Anthony, Elizabeth Strock, and Nickolaos G. Travlos, 1990, “Ownership Structure, Deregulation, and Bank Risk Taking,” *Journal of Finance* 45, 643-654.

Saxonhouse, G., 1976, “Estimated Parameters as Dependent Variables,” *American Economic Review* 66, 178-183.

Smith, Clifford W., and Ross L. Watts, 1992, “The Investment Opportunity Set and Corporate Financing, Dividends, and Compensation Policies,” *Journal of Financial Economics* 32, 263-292.

Stulz, René M., 1988, “Managerial Control of Voting Rights: Financing Policies and the Market for Corporate Control,” *Journal of Financial Economics* 20, 25-54.

Stulz, René M., 1990, “Managerial Discretion and Optimal Financing Policies,” *Journal of Financial Economics*, 26, 3-27.

Zwiebel, Jeffrey, 1996, “Dynamic Capital Structure under Managerial Entrenchment,” *American Economic Review* 86, 1197-1215.

Table 1

Summary Statistics of Bank Holding Companies

+Measured in thousands of dollars.
*Inefficiency ratios are the amount of lost value divided by the observed market value.

Sample (n=190)	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
Asset Inefficiency Ratio*	0.028917	0.034162	0.000136	0.223104
Market-to-Book Assets	1.036370	0.032153	0.970276	1.171883
Book Value of Assets+	12613070.60	31505390.20	159860.00	250489000.00
B.V. Capital/B.V. Assets	0.084983	0.015936	0.044244	0.135397
Narrow Charter Value+	12832551.77	31509885.92	210831.84	247667615.08
Index of Macro Diversification	0.946004	0.314560	0.431099	2.062936
Economic Growth	0.094394	0.027704	-0.054195	0.146797
Herfindahl Index	0.234054	0.112560	0.059280	0.646310
% Ownership by Insiders (n=164)	13.116585	13.582564	0.342000	66.018000
% Ownership by Outside Block-holders (n=164)	3.147963	6.341309	0.000000	33.051000
% Stock Options Granted to Insiders (n=164)	0.340841	0.580343	0.000000	3.815000
Number of Security Analysts (n=164)	7.932927	9.614107	0.000000	40.000000

Table 2

OLS Regressions of (Asset) Market-Value Inefficiency on the Production Plan

The dollar amount of market-value inefficiency, defined by equation (5), is regressed on variables that characterize a bank's balance sheet and off-balance sheet: asset quality, labor, physical capital, market growth, and market power. This regression is described in equation (1).
*Significant at the 10% level, ** at the 5% level, *** at the 1% level. White's Heteroskedasticity Robust Standard Errors are reported in brackets.

	Full N=190	**Book Value Assets <$2 Bil. N=96**	**Book Value Assets >$2 Bil. N=94**	**Less Capital <7.73% N=64**	**More Capital >7.73% N=126**
Constant	34753.07*** [113.9422]	34616.83*** [23.92]	34958.31*** [238.026]	34784.38*** [178.52]	34611.46*** [57.64]
Cash and Securities	-0.00059 [0.00047]	-0.00048 [0.00053]	-0.00075 [0.00044]	-0.0019*** [0.00029]	0.0014* [0.00082]
C&I Loans	-0.00023 [0.00046]	-0.00066 [0.00053]	-0.00035 [0.00043]	-0.0018*** [0.00035]	0.0011 [0.00068]
Agricultural Loans	-0.0018* [0.0010]	-0.00064 [0.00067]	-0.0019** [0.00094]	-0.0013 [0.00098]	0.0029** [0.0012]
Individual Loans	-0.00049 [0.00046]	-0.00057 [0.00052]	-0.00055 [0.00042]	-0.0017*** [0.00033]	0.0011* [0.00066]
Real Estate Estate	-0.00059 [0.00044]	-0.00081 [0.0055]	-0.00072* [0.00042]	-0.0018*** [0.00027]	0.0013 [0.00083]
Other Loans	-0.0011** [0.00051]	0.00053 [0.0087]	-0.0011** [0.00049]	-0.0023*** [0.00035]	0.00096 [0.0011]
Leases	-0.0014** 0.000709]	-0.00025*** [0.00075]	-0.0015** [0.00065]	-0.0043*** [0.00070]	0.00040 [0.00093]
Trading Account	-0.00083 [0.00053]	-0.0014** [0.00065]	-0.00097* [0.00049]	-0.0032*** [0.00051]	0.0012 [0.0012]
Unconsolidated Subsidiaries	0.0081 [0.0053]	-0.023** [0.0099]	0.0051 [0.0053]	0.038*** [0.0064]	0.017*** [0.0056]
Intangible Assets	-0.0012 [0.0014]	-0.0018 [0.0014]	-0.00039 [0.0014]	0.00021 [0.0017]	0.0030*** [0.00078]
Other Assets	0.00051 [0.00043]	-0.000080 [0.0011]	0.00048 [0.00042]	-0.0023** [0.00088]	0.0018* [0.00093]
Acceptances	-0.0017 [0.0024]	-0.016 [0.022]	-0.0020 [0.0021]	0.0051 [0.0036]	0.0032** [0.0014]
Book Value Equity	-0.0011* [0.00056]	-0.0071 [0.00061]	-0.0015*** [0.00057]	0.0019*** [0.00060]	-0.0020* [0.0011]

TABLE 2 (continued)					
	Full N=190	**Book Value Assets <$2 Bil. N=96**	**Book Value Assets >$2 Bil. N=94**	**Less Capital <7.73% N=64**	**More Capital >7.73% N=126**
Nonperforming Assets	-0.0013 [0.0014]	0.0020** [0.00086]	-0.00089 [0.0014]	-0.0064*** [0.0014]	0.00062 [0.0019]
Economic Growth	-217.33 [900.11]	-126.64 [216.52]	-273.29 [1400.52]	-784.15 [1559.95]	-516.30 [655.20]
Credit Guarantees	0.000040* [0.000023]	0.00023** [0.00010]	0.000047** [0.000022]	-0.000087** [0.000037]	0.000039 [0.000047]
Swaps	0.000072*** [0.000015]	0.00024 [0.00034]	0.000076*** [0.000013]	0.000044** [0.000017]	0.000091 [0.000064]
Futures and Options	-0.0000094 [0.0000068]	0.0015** [0.00069]	-0.000012* [0.0000067]	0.000035** [0.000014]	-0.000027 [0.000027]
Labor	0.057 [0.065]	0.21*** [0.079]	0.025 [0.064]	-0.011 [0.062]	0.019 [0.076]
Physical Capital	0.0014 [0.024]	-0.0039** [0.0015]	0.0016 [0.0022]	-0.0061** [0.00025]	0.0034*** [0.0012]
Uninsured Domestic Deposits	0.0012** [0.00051]	0.00065 [0.00051]	0.0011** [0.00049]	0.0022*** [0.00031]	-0.0014* [0.00078]
Other Domestic Deposits	0.00053333 [0.00050192]	0.00061276 [0.00056]	0.000689 [0.00046]	0.00218*** [0.00035]	-0.0014* [0.00079]
Other Borrowed Funds	0.00061 [0.00049]	0.00086 [0.00056]	0.00079* [0.00045]	0.0021*** [0.00034]	-0.0015* [0.00078]
Herfindahl Index	-101.88 [161.20]	-59.54 [48.71]	173.21 [631.42]	-590.45** 270.072	87.29 [106.023]
Adjusted R^2	0.836	0.507	0.825	0.960	0.875
F-statistic	41.195 F(24,165)	5.066 F(24,71)	19.262 F(24,69)	64.285 F(24,39)	37.384 F(24,101)

Table 3

OLS Regressions: The Difference between the Market Value and Book Value of Assets Regressed on the Production Plan

The dollar amount of the market-to-book difference is regressed on variables that characterize a bank's balance sheet and off-balance sheet: asset quality, labor, physical capital, market growth, and market power. This regression is described in equation (1).
*Significant at the 10% level, ** at the 5% level, *** at the 1% level. White's Heteroskedasticity Robust Standard Errors are reported in brackets.

	Full N=190	**Book Value Assets <$2 Bil. N=96**	**Book Value Assets >$2 Bil. N=94**	**Less Capital <7.73% N=64**	**More Capital >7.73% N=126**
Constant	875.28 [55095.55]	-15824.41 [11604.72]	49987.45 [112004.44]	-61522.86 [98131.96]	-12425.91 [28039.87]
Cash and Securities	0.51** [0.24]	0.21 [0.26]	0.55** [0.24]	1.011*** [0.22]	-0.66* [0.38]
C&I Loans	0.37* [0.22]	0.30 [0.26]	0.40* [0.22]	0.94*** [0.25]	-0.45 [0.31]
Agricultural Loans	1.31*** [0.44]	0.30 [0.32]	1.36*** [0.44]	0.23 [0.73]	-1.36** [0.56]
Individual Loans	0.37 [0.23]	0.25 [0.25]	0.39* [0.23]	0.81*** [0.23]	-0.50 [0.30]
Real Estate Loans	0.58** [0.22]	0.38 [0.26]	0.62*** [0.23]	0.93*** [0.21]	-0.61 [0.38]
Other Loans	0.69** [0.27]	-0.33 [0.42]	0.71*** [0.27]	1.08*** [0.23]	-0.44 [0.52]
Leases	0.83** [0.41]	1.24*** [0.36]	0.86** [0.40]	2.24*** [0.50]	-0.10 [0.43]
Trading Account	0.60** [0.25]	0.63** [0.31]	0.64** [0.25]	1.53*** [0.34	-0.58 [0.57]
Unconsolidated Subsidiaries	-0.95 [2.57]	10.67** [4.77]	-0.30 [2.72]	-17.36*** [3.84]	-8.87*** [2.73]
Intangible Assets	-0.87 [0.72]	0.86 [0.67]	-0.96 [0.78]	-1.27 [1.06]	-1.34*** [0.37]
Other Assets	0.63*** [0.20]	-0.030 [0.51]	0.64*** [0.20]	1.23** [0.57]	-0.64 [0.43]
Acceptances	1.40 [1.012]	7.62 [10.58]	1.48 [.99]	-1.26 [2.16]	-1.54** [0.66]
Book Value Equity	0.35 [0.26]	0.40 [0.30]	0.41 [0.29]	-0.29 [0.36]	1.012* [0.55]

TABLE 3 (continued)					
	Full N=190	**Book Value Assets <$2 Bil. N=96**	**Book Value Assets >$2 Bil. N=94**	**Less Capital <7.73% N=64**	**More Capital >7.73% N=126**
Nonperforming Assets	-0.39 [0.70]	-0.97** [0.42]	-0.51 [0.73]	3.44*** [0.88]	-0.44 [0.92]
Economic Growth	-138803.04 [460796.2]	66661.50 [105314.8]	-168541.85 [676583.8]	129018.49 [873920.2]	313192.18 [319510.0]
Credit Guarantees	-0.00065 [0.011]	-0.11** [0.049]	-0.0014 [0.011]	0.033 [0.021]	-0.038 [0.023]
Swaps	-0.00076 [0.0075]	-0.11 [0.16]	-0.0081 [0.0076]	0.010 [0.011]	-0.067** [0.030]
Futures and Options	-0.0044 0.0034	-0.60 [0.33]	-0.0041 [0.0035]	-0.025*** [0.0088]	0.015 [0.013]
Labor	18.85 [32.41]	-96.92** [37.76]	21.69 [34.6]	87.86** [37.98]	-7.75 [35.12]
Physical Capital	-0.70 [0.94]	1.82** [0.73]	-0.72 [0.94]	2.50* [1.48]	-1.52*** [0.55]
Uninsured Domestic Deposits	-0.74*** [0.25]	-0.25 [0.24]	-0.75*** [0.25]	-1.12*** [0.27]	0.69* [0.36]
Other Domestic Deposits	-0.50** [0.24]	-0.24 [0.27]	-0.55** [0.24]	-1.10*** [0.26]	0.65* [0.37]
Other Borrowed Funds	-0.55** [0.24]	-0.36 [0.27]	-0.60** [0.24]	-1.12*** [0.25]	0.73** [0.36]
Herfindahl Index	-66678.17 [72447.41]	27055.61 [23729.02]	-436699.03 [290714.49]	219014.08 [152032.44]	-60698.11 [53384.10]
Adjusted R^2	0.912	0.663	0.884	0.952	0.969
F-statistic	82.119 F(24,165)	8.776 F(24,71)	30.638 F(24,69)	53.400 F(24,39)	165.644 F(24,101)

Table 4

Difference-in-Means Tests

A value in **bold** in the third and fourth columns is significantly different at the 5% level from the mean of the group reported in the second column.
‡The value in the cell in Panel A is significantly different at the 5% level from the corresponding value in the cell in Panel B in the same column.
+ Measured in thousands of dollars.
* Inefficiency ratio is the amount of lost market value divided by the book-value investment (adjusted to remove goodwill) in assets.
**Investment Opportunity Ratio is the highest potential (frontier) value of assets divided by the book-value (adjusted to remove goodwill) investment in assets

Panel A

Variable	Groups defined by Capital Strategy and Efficiency		
	More Capitalized / Efficient	**More Capitalized / Inefficient**	**Less Capitalized / Inefficient**
Asset Inefficiency Ratio*	‡ 0.007	**0.052**	**0.060**
Market-to-Book Asset Ratio	‡ 1.041	‡ 1.044	**‡ 1.021**
Investment Opportunity Ratio **	‡ 1.039	**1.111**	**1.110**
Book value of Assets +	‡ 14,300,742.7	**892,278.9**	**868,354.3**
Index of Macro Diversification	1.016	**0.895**	0.915
% Insider Ownership	7.790	**16.031**	**23.287**
% Outside Block Ownership	‡ 2.887	1.068	3.656
% Insider Stock Options	0.202	**0.408**	0.535
Number of Securities Analysts	12.568	**1.857**	**1.591**

Panel B

Variable	Groups defined by Capital Strategy and Efficiency		
	Less Capitalized / Efficient	**Less Capitalized / Inefficient**	**More Capitalized / Inefficient**
Asset Inefficiency Ratio*	‡ 0.004	**0.060**	**0.052**
Market-to-Book Asset Ratio	‡ 1.026	‡ 1.021	**‡ 1.044**
Investment Opportunity Ratio**	‡ 1.031	**1.110**	**1.111**
Book value of Assets +	‡ 37,842,412.8	**868,354.3**	**892,278.9**
Index of Macro Diversification	0.969	0.915	0.895
% Insider Ownership	8.174	**23.287**	**16.031**
% Outside Block Ownership	‡ 6.902	3.656	**1.068**
% Insider Stock Options	0.273	0.535	0.408
Number of Securities Analysts	17.030	**1.591**	**1.857**

Table 5

Influence of Managerial Incentives on Investment Strategy and Efficiency

Using the estimated log-linear bivariate logistic regression (equation (6)), the marginal influence of managerial incentives and control variables is calculated for the probability that a bank pursues a more or less capitalized investment strategy and is relatively efficient or inefficient: $\partial p(CapRatio = 1 \text{ or } 0, Inef = 1 \text{ or } 0) / \partial \mathbf{z}_1$ where

CapRatio = 1 when capital-to-assets ratio > 7.73% and 0 otherwise
Inef = 1 when market-value inefficiency to adjusted book value of assets > median value and 0 otherwise.

The values in the table are the derivatives, $\partial p(CapRatio = 1 \text{ or } 0, Inef = 1 \text{ or } 0) / \partial \mathbf{z}_1$
where $\mathbf{z}_1 \equiv$(narrow charter value, % insider ownership, % insider options granted, % outside block-holder ownership, number of analysts following the bank, asset size, diversification index).

The first value in each cell represents the mean derivative for the full sample. White's Heteroskedasticity Robust Standard Error and is reported in brackets for the full-sample value. The mean derivative for three levels of insider ownership are also reported in the cells. To economize on space, their standard errors are omitted, but their significance is indicated by asterisks.

*Significant at the 10% level, **at the 5% level, ***at the 1% level.

Variable Name	More Capitalized/ Efficient	More Capitalized/ Inefficient	Less Capitalized/ Efficient	Less Capitalized/ Inefficient
Charter Value–full	66.63417023***	282.85206644***	-66.63410015***	-282.85213652***
sample; and where	[23.87720]	[91.40287]	[23.87734]	[91.40394]
insiders own 0 - 5%	-13.04827590	5.55464349	13.04839090	-5.55475849
insiders own 5 - 25%	121.78316038***	157.81237406***	-121.78309552***	-157.81243893***
insiders own > 25%	46.47946788	1210.54983857***	-46.47946788	-1210.54983847***
% Insider Ownership	-0.00419434	-0.00307554*	0.00419434	0.00307554*
full sample; and where	[0.00705]	[0.00158]	[0.00705]	[0.00158]
insiders own 0 - 5%	-0.00745522	-0.00057658	0.00745522	0.00057658
insiders own 5 - 25%	-0.00363337	-0.00427010	0.00363337	0.00427010
insiders own > 25%	0.00031988	-0.00412769	-0.00031988	0.00412769
% Block-holder Owner-	-0.02037430**	-0.18037886	0.02037431**	0.18037886
ship–full sample; where	[0.00876]	[1.94154]	[0.00876]	[1.94155]
insiders own 0 - 5%	-0.00531725	-0.01905799	0.00531722	0.01905802
insiders own 5 - 25%	-0.03423082***	-0.36087738	0.03423084***	0.36087735
insiders own > 25%	-0.00575071	0.07716514	0.00575071	-0.07716514
% Stock Options	0.39704288**	-0.07858911	-0.39704279**	0.07858902
Granted to Insiders;	[0.17972]	[0.06123]	[0.17973]	[0.06123]
insiders own 0 - 5%	0.39765132	-0.01358804	-0.39765111	0.01358783
insiders own 5 - 25%	0.52739381***	-0.08650441	-0.52739376***	0.08650436
insiders own > 25%	-0.01449298	-0.17885782	0.01449298	0.17885782
Number of Security	0.01171379	0.00480593	-0.01171381	-0.00480592
Analysts; and where	[0.00962]	[0.02679]	[0.00962]	[0.02679]
insiders own 0 - 5%	0.05160159**	0.00132917	-0.05160162***	-0.00132915
insiders own 5 - 25%	-0.00882717	0.01150649	0.00882716	-0.01150647
insiders own > 25%	-0.00044115	-0.00959242	0.00044115	0.00959242
Total Assets--full	-69.68505766***	-291.06695892***	69.68511598***	291.06690060***
sample; and where	[24.67880]	[95.93329]	[24.67940]	[95.93298]
insiders own 0 - 5%	10.40040394	-7.57812701	-10.40030029	7.57802336
insiders own 5 - 25%	-125.65659086***	-173.12307372***	125.65663998***	173.12302461***
insiders own > 25%	-47.71704584	-1208.35027379***	47.71704584	1208.35027379***
Index of Macro	-0.05908506	0.01509300	0.05908486	-0.01509280
Diversification – full	[0.09247]	[0.08175]	[0.09248]	[0.08175]
sample (no significant				
sub-sample values)				

Figure 1A

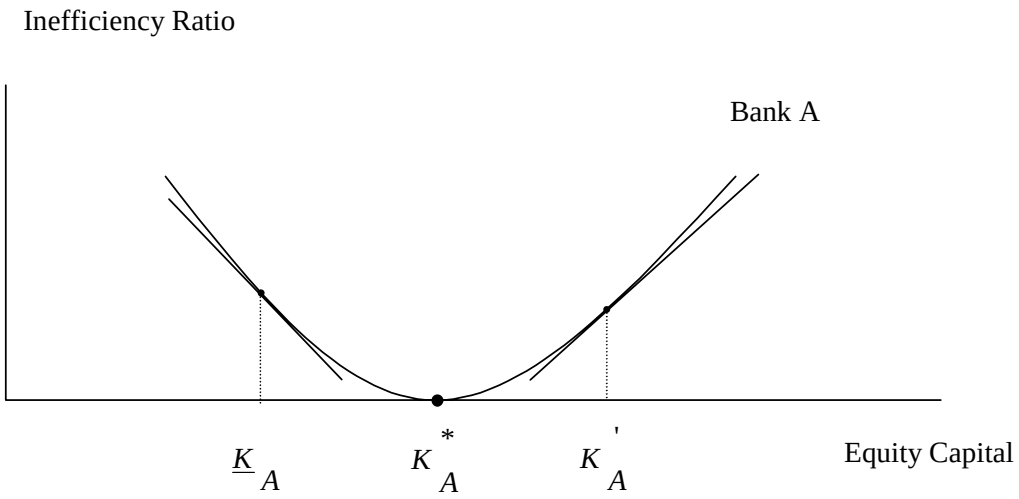

Figure 1B